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STEREOMICROSCOPIC EVALUATION OF MICROLEAKAGE USING CENTION N AND CONVENTIONAL GLASS IONOMER CEMENT : AN INVITRO STUDY

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ABSTRACT :

The objective of this study was to assess the microleakage of the new tooth-coloured, resin-based, filling material Cention N and Conventional Glass Ionomer Cement after thermocycling procedures by using stereomicroscope.

MATERIALS AND METHODS : Thirty extracted noncarious premolars were used. Surface debridement with hand-scaling instruments was done and were further stored in normal saline at room temperature till the time they were put in use. Preparations were made on the buccal surface at the dentin-enamel junction with length 3.0 mm, height 2.0 mm, depth 2.0 mm. Specimens were randomly divided into two groups : Group A- Cention N and Group B- Conventional Glass Ionomer Cement. Specimens were subjected to thermocycling between 5ºC ± 4ºC and 55ºC ± 4ºC for 500 temperature cycles. Following thermocycling, the teeth were placed in a solution of 0.5% Methylene blue dye for 24 h at room temperature. After removal from the dye solution, the teeth were allowed to dry and then each tooth was sectioned in a buccolingual direction through the center of the restorations to examine dye penetration using a carborundum disk. The specimens were then studied under a stereomicroscope to measure the depth of the dye penetration on the occlusal and gingival walls of both halves of the teeth. Scoring for microleakage was carried out independently by two examiners in order to eliminate bias. The scoring was performed independently by two examiners. Data analysis was done using ANOVA, with SPSS package 16.0.

RESULTS : According to the results, Group B (Conventional GIC) exhibited the highest micro leakage and least microleakage was shown by Group A (Cention N). This is a promising result for this material that is targeted for application in conjunction with the restoration of the teeth.

Keywords : Microleakage, polymerization shrinkage, dye penetration

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INTRODUCTION

Over the past years esthetic dentistry has shown considerable progress leading to the development of a number of improved restorative materials. Currently, the main concerns regarding the performance of these materials refers to their durability and the integrity of marginal sealing. One of the most important problems of restorative dentistry today is the failure of restorative materials to completely bond to enamel and dentin, causing microleakage[1]. Microleakage is defined as the clinically undetectable passage of bacteria, fluids, molecules or ions between tooth and the restorative material. Since the introduction in 1972 glass ionomer cements (GIC) have been widely used as restorative materials, luting cements and base materials with the added advantage of chemical bonding and fluoride release.[1] These materials have also been widely used for restoration of cervical lesions but the main disadvantages are moisture sensitivity and low mechanical strength during the early stages of setting. Cention N is a recently introduced tooth-coloured, basic filling material for bulk placement in retentive preparations with or without the application of an adhesive. It is an “alkasite” restorative which is a new category of filling material, like compomer or ormocer and is essentially a subgroup of the composite resin[2]. Cention N is a UDMAbased, self curing powder/liquid restorative with optional additional light-curing. The liquid comprises of

dimethacrylates and initiators, whilst the powder contains various glass fillers, initiators and pigments. It is radio opaque and contains alkaline glass fillers capable of releasing fluoride, calcium and hydroxide ions. Due to the sole use of cross-linking methacrylate monomers in combination with a stable, efficient self cure initiator, Cention N exhibits a high polymer network density and degree of polymerization over the complete depth of the restoration. It also includes special patented filler (Isofiller) which acts as a shrinkage stress reliever and due to its low elastic modulus this shrinkage stress reliever within Cention N reduces polymerization shrinkage and microleakage[3]. Cention N offers a cost-effective substitute for amalgam and also fulfills the need for an esthetic bulk fill material in the posterior region.

The aim of the present study was to evaluate the microleakage of Cention N and Glass Ionomer Cement.

MATERIAL AND METHODS :

Thirty extracted noncarious premolars were used in this study. Surface debridement with hand-scaling instruments was done and were further stored in normal saline at room temperature till the time they were put in use. Preparations were made on the buccal surface at the dentin-enamel junction with the dimensions : length 3.0 mm, height 2.0 mm, depth 2.0 mm. Subsequently, teeth were randomly assigned into two experimental groups (n = 10).

Group A- Restored with Cention N

Group B- Restored with Glass Ionomer Cement

Specimens were subjected to thermocycling between 5ºC ± 4ºC and 55ºC ± 4ºC for 500 temperature cycles. Following thermocycling, the teeth were placed in a solution of 0.5% Methylene blue dye for 24 h at room temperature. After removal from the dye solution, the teeth were allowed to dry and then each tooth was sectioned in a buccolingual direction through the center of the restorations to examine dye penetration using a carborundum disk. The specimen were then evaluated under stereomicroscope (20×)

Serial no.	**Group A (Cention N)**		**Group A (Conventional GIC)**	
	OCCLUSAL	**GINGIVAL**	**OCCLUSAL**	**GINGIVAL**
1.	0	2	4	4
2.	0	1	3	2
3.	1	3	3	3
4.	1	4	4	4
5.	0	1	4	3
6.	1	1	4	4
7.	0	0	2	3
8.	0	2	4	3
9.	1	0	3	4
10.	1	0	4	3

MEAN SCORE

GROUPS	**OCCLUSAL**	**GINGIVAL**
GROUP A	0.3	1.5
GROUP B	3.4	3.1

The degree of microleakage will be determined by the following criteria described by Khera and Chan as follows:

0 : No leakage

1 : Less than and up to one-half of the depth of the cavity preparation penetrated by the dye

2 : More than one-half of the depth of the cavity preparation penetrated by the dye but not up to the junction of the axial and occlusal or gingival wall

3 : Dye penetration up to the junction of the axial and occlusal or gingival wall but not including the axial wall

4 : Dye penetration including the axial wall

STATISTICAL ANALYSIS :

Scoring for microleakage was carried out independently by two examiners in order to eliminate bias. The scoring was performed independently by two examiners.

Data analysis was done using ANOVA, with SPSS package 16.0

DISCUSSION :

Microleakage is an important criteria that has been used in assessing the success of any restoration but inspite of major progress in restorative dentistry it still remains an undesirable possibility[1]. Composite Resin have been used for aesthetic restoration but its shrinkage during polymerisation resulted in contraction stresses within the restoration leading to marginal failure and subsequent microleakage[8]. This leads to poor marginal seal, secondary caries ,marginal staining, postoperative sensitivity and partial or total loss of restoration[4]. Modern composite resins undergo volumetric contractions ranging between 2.6% to 4.8% Also the coefficient of thermal expansion of composite resin (25 to 60 ×10-6/°C) is several times higher than that of enamel (11.4 ×10-6/°C) and dentin (8 ×10-6/°C) . This physical property is also reported to be responsible for microleakage in resin based restorations. Glass Ionomer cements bond chemically to tooth structure, achieved via an exchange of ions arising from both the tooth and restoration leading to formation of calcium-polyacrylate bond (coefficient of thermal expansion of of conventional Glass Ionomer cements (11×10-6/°C have been shown to be closure to tooth structure { enamel (11.4 ×10- 6/°C),dentin(8 ×10-6/°C)} than resin composites hence there is less chances of formation of voids or openings at the tooth restoration interface when temperature changes occur[5]. These cements are highly technique sensitive and the most critical aspect is isolation from moisture for the first 30 minutes after placement[6]. On exposure to water the matrix forming ions are easily leached out during the initial set which could interfere at tooth restoration interface. Also excessive dehydration can result in a chalky, crazed or a cracked surface leading to considerable marginal leakage.

Cention N is a tooth-colored, filling material for direct restorations. It is a UDMAbased, self curing powder/liquid restorative with optional additional light-curing. The liquid comprises of dimethacrylates and initiators, whilst the powder contains various glass fillers, initiators and pigments. Due to the sole use of cross-linking methacrylate monomers in combination with a stable, efficient self-cure initiator, Cention N exhibits a high polymer network density and degree of polymerization over the complete depth of the restoration[7] .It also includes a special patented filler (Isofiller) which acts as a shrinkage stress reliever minimising the shrinkage force. The organic/inorganic ratio as well as the monomer composition of the material is also responsible for the low volumetric shrinkage leading to least microleakage. The results show that there is significant difference in microleakage of two restorative materials. CENTION N showed less microleakage than Conventional Glass Ionomer Cement.

CONCLUSION :

It is concluded that Cention N can be used as a new alternative modality for restoration as compared to many of the previously used restorative materials in the dentistry. this material of choice can be a cost-effective way to deliver a high-quality, predictable restoration, and consume less time.

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